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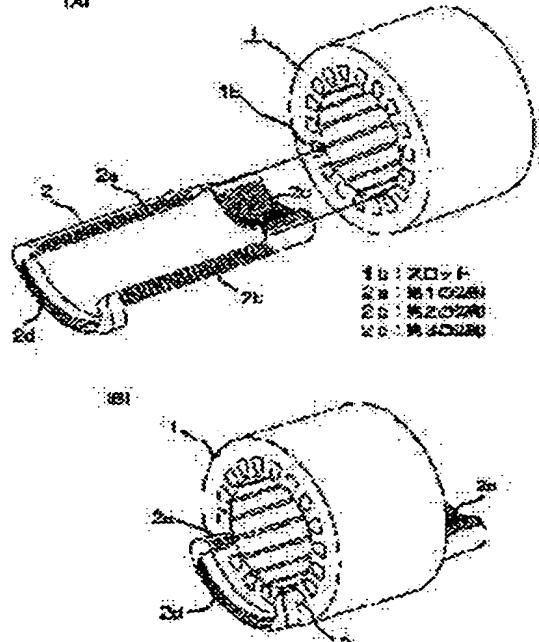
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## (54) STATOR FOR ROTATING ELECTRIC MACHINE AND ITS MANUFACTURING METHOD

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a stator for a rotating electric machine in which the occupying ratio of a coil is raised to improve its efficiency.

SOLUTION: The stator for the rotating electric machine comprises a core 1 having slots 1b formed via a predetermined interval on an inner peripheral surface thereof and including a width smaller than that of the opening of the slit 1b, and a coil. In the coil, first and second sides 2a, 2b respectively mounted in a pair of at least corresponding slots 1b are wound in an alignment and laminated in a thickness connectibly inserted in both slots 1b; a third side 2c continued to one end sides of the first and second sides 2a, 2b is deviated in the extending direction of the first and second sides 2a, 2b, so that the thickness in the laminating direction is smaller than the width of the opening of the slit 1b and formed in a plurality of coil assembly 2; and the third side 2c is passed through the opening of the slit 1b so that the first and second sides 2a, 2b are sequentially mounted in both the slots 1b and formed.



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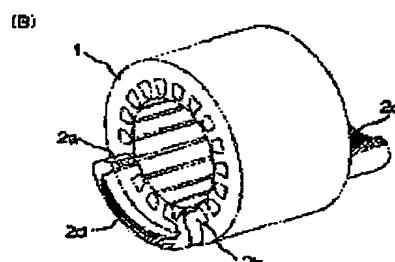
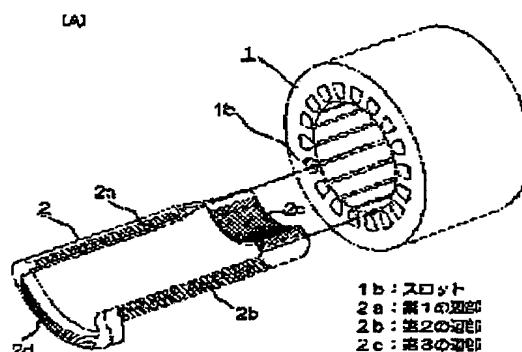
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## (54) 【発明の名称】 回転電機の固定子およびその製造方法

## (57) 【要約】

【課題】 コイルの占積率を高め効率の向上を図ることを可能な回転電機の固定子を提供する。

【解決手段】 内周面に所定の間隔を介して形成されるスロット1りの幅よりスロット1りの開口部の幅が狭く形成された銛心1と、巻回され、少なくとも対応する一対のスロット1bにそれぞれ接着される第1および第2の辺部2a、2bが、整列巻きされて両スロット1b内に該辺可能な厚さに積層され、第1および第2の辺部2a、2bの一端側に連なる第3の辺部2cが、第1および第2の辺部2a、2bの延在方向にすれで積層方向の厚さがスロット1bの開口部の幅より小さく積層されて形成された複数のコイル組合体2を、第3の辺部2cをスロット1bの開口部を通過させることにより第1および第2の辺部2a、2bを両スロット1b内に順次装着して形成されるコイルとを備える。



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## 【特許請求の範囲】

【請求項1】 内周面に所定の間隔を介して形成されるスロットの幅より上記スロットの開口部の幅が狭く形成された鉄心と。

巻回され、少なくとも対応する一対の上記スロットにそれぞれ装着される第1および第2の辺部が、整列巻きされて上記両スロット内に嵌挿可能な厚さに積層され、上記第1および第2の辺部の一端側に迫なる第3の辺部が、上記第1および第2の辺部の延在方向にすれで積層方向の厚さが上記スロットの開口部の幅より小さく積層されて形成された複数のコイル組合体を、上記第3の辺部を上記スロットの開口部を通過させることにより上記第1および第2の辺部を上記両スロット内に順次接着して形成されるコイルとを備えたことを特徴とする回転電機の固定子。

【請求項2】 線材の少なくともスロットにそれぞれ装着される第1および第2の辺部に位置する部位は、積層方向に隣接する当接面同士が偏平状に成形されていることを特徴とする請求項1記載の回転電機の固定子。

【請求項3】 巷回し、内周面に所定の間隔を介して形成されるスロットの幅より上記スロットの開口部の幅が狭く形成された鉄心の少なくとも対応する一対の上記スロットにそれぞれ装着される第1および第2の辺部を整列巻きして上記両スロット内に嵌挿可能な厚さに、上記第1および第2の辺部の一端側に迫なる第3の辺部を上記第1および第2の辺部の延在方向にすらして、積層方向の厚さが上記スロットの開口部の幅より小さな厚さにそれぞれ積層して複数のコイル組合体を形成する工程と。

上記コイル組合体の姿勢を保持する工程と、  
上記各コイル組合体を上記鉄心の一端側から接近させて上記第3の辺部を上記両スロットの開口部を通過させるとともに、上記鉄心の一端側から他端側に移動させることにより第1および第2の辺部を上記両スロット内に導きそれら接着する工程とを包含したことを特徴とする回転電機の固定子の製造方法。

【請求項4】 線材の少なくともスロットにそれぞれ装着される第1および第2の辺部に位置する部位は、積層方向に隣接する当接面同士を偏平状に成形して整列巻きするようにしていることを特徴とする請求項3記載の回転電機の固定子の製造方法。

【請求項5】 コイル組合体の姿勢を周囲を削脂で固めることにより保持するようにしたことを特徴とする請求項3または4記載の回転電機の固定子の製造方法。

【請求項6】 各コイル組合体の第3の辺部を成形して出っ張りを抑制する工程を包含したことを特徴とする請求項3ないし6のいずれかに記載の回転電機の固定子の製造方法。

## 【発明の詳細な説明】

【0001】

【発明の属する技術分野】この発明は、スロット帽よりスロットの開口帽が狭く形成された鉄心のスロット内に、コイルが占積率よく接着された回転電機の固定子およびその製造方法に関するものである。

## 【0002】

【従来の技術】近年、省エネのため効率の良いモータが市場から求められており、一般に鉄心のスロット内に装着されるコイルの密度、すなわち占積率を向上させることでモータの効率の向上が図られている。そして、上記のようなコイルの占積率を向上させるために、図示はしないが例えば特開平10-271733号公報では、予めスロット外でスロットの断面に応じた断面の束に整列巻きされたコイルを、その形状を保持した状態でスロットの帽と同じ帽の開口側から半径方向に挿入して接着することが開示されている。

## 【0003】

【発明が解決しようとする課題】従来の回転電機の固定子は以上のように、予めスロット外でスロットの断面に応じた断面の束に整列巻きされたコイルを、その形状を保持した状態でスロットの帽と同じ帽の開口側から半径方向に挿入して接着することにより、コイルの占積率の向上が図られている。しかしながら、スロットの開口部の帽が大きいと、空隙部における磁気抵抗が増大し、誘導電動機等では励磁電流の増大、永久磁石式電動機では有効磁束の減少を招き、さらに、磁気的な凹、凸が大きくなることからスロット高調波が増大して、回転子、固定子に発生する高調波損失が増大し、さらに加えて、サーボモータ等においてはコギングの増大につながり、位置決め時の制御性が低下する等、種々の問題点が生じる。

【0004】このため、磁極ティース部の先端を周方向両側に突出させることにより、スロットの開口部の幅をスロットの幅より狭くした鉄心を用いることになるが、この場合、上記のように予めスロット外でスロットの断面に応じた断面の束に整列巻きされたコイルを、そのままスロットの開口部側から半径方向に挿入させることができなくなるため、コイルの占積率を高めてモータの効率を向上させることができなくなるという問題点があつた。

【0005】この発明は上記のような問題点を解消するためになされたもので、スロットの開口部の幅がスロットの帽より狭く形成された鉄心においても、コイルの占積率を高めモータの効率を向上させることができ可能な回転電機の固定子およびその製造方法を提供することを目的とするものである。

## 【0006】

【課題を解決するための手段】この発明の請求項1に係る回転電機の固定子は、内周面に所定の間隔を介して形成されるスロットの幅よりスロットの開口部の帽が狭く形成された鉄心と、巻回され、少なくとも対応する一対

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のスロットにそれぞれ接着される第1および第2の辺部が、整列巻きされて両スロット内に嵌挿可能な厚さに積層され、第1および第2の辺部の一端側に連なる第3の辺部が、第1および第2の辺部の延在方向にずれて積層方向の厚さがスロットの開口部の幅より小さく積層されて形成された複数のコイル組合体を、第3の辺部をスロットの開口部を通過させることにより第1および第2の辺部を両スロット内に順次接着して形成されるコイルとを備えたものである。

【0007】又、この発明の請求項2に係る回転電機の固定子は、請求項1において、線材の少なくともスロットにそれぞれ接着される第1および第2の辺部に位置する部位の積層方向に隣接する当接面同士を偏平状に成形したものである。

【0008】又、この発明の請求項3に係る回転電機の固定子の製造方法は、矩形状に巻回し、内周面に所定の間隔を介して形成されるスロットの幅よりスロットの開口部の幅が狭く形成された鉄心の少なくとも対応する一対のスロットにそれぞれ接着される第1および第2の辺部を整列巻きして両スロット内に嵌挿可能な厚さに、第1および第2の辺部の各一端側に連なる第3の辺部を第1および第2の辺部の延在方向にずらして、積層方向の厚さがスロットの開口部の幅より小さな厚さにそれぞれ接着して複数のコイル組合体を形成する工程と、コイル組合体の姿勢を保持する工程と、各コイル組合体を鉄心の一端側から接近させて第3の辺部を両スロットの開口部を通過させるとともに、鉄心の一端側から他端側に移動させることにより第1および第2の辺部を両スロット内に導きそれぞれ接着する工程とを包含するものである。

【0009】又、この発明の請求項4に係る回転電機の固定子の製造方法は、請求項3において、線材の少なくともスロットにそれぞれ接着される第1および第2の辺部に位置する部位の積層方向に隣接する当接面同士を偏平状に成形して整列巻きするようにしたものである。

【0010】又、この発明の請求項5に係る回転電機の固定子の製造方法は、請求項3または4において、コイル組合体の姿勢を周囲を樹脂で固めることにより保持するようにしたものである。

【0011】又、この発明の請求項6に係る回転電機の固定子の製造方法は、請求項3ないし5のいずれかにおいて、各コイル組合体の第3の辺部を成形して出っ張りを抑制する工程を包含したものである。

【0012】

【発明の実施の形態】以下、この発明の実施の形態を図に基づいて説明する。

実施の形態1、図1はこの発明の実施の形態1における回転電機の固定子の構成を示し、(A)は正面断面図、(B)は部分詳細図、図2は図1におけるコイル組合体の構成を示す斜視図、図3は図2におけるコイル組合体

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が鉄心に接着された状態を示す正面図、図4は図3におけるコイル組合体の鉄心への接着手順を示し、(A)は接着前の斜視図、(B)は接着後の斜視図、図5ないし図13は図1における回転電機の固定子の製造の各工程を示す図である。

【0013】図において、1は円筒状を有する鉄心で、内周面に所定の間隔を介して突出し先端が両側に出っ張った複数の磁極テイース部1aが形成されており、これら各磁極テイース部1a間に、開口部の幅w1がその幅w1より狭いスロット1bがそれぞれ形成されている。2は線材3が矩形状に巻回されたコイル組合体で、所定のスロット1bとこれからn個離れた位置のスロット1bに接着される第1および第2の辺部2a、2bは整列巻きされてスロット1b内に嵌挿可能な厚さに積層され、これら第1および第2の辺部2a、2bの一端側に連なる第3の辺部2cは、各線材3が第1および第2の辺部2a、2bの延在方向にずれて、積層方向の厚さtが鉄心1のスロット1bの開口部の幅w1より小さく積層され、第1および第2の辺部2a、2bの他端側に連なる第4の辺部2dは、鉄心1の形状に沿った彎状に積層されている。そして、このコイル組合体3が、n個ずつ離れた一対のスロット1b内に、第1および第2の辺部2a、2bが接着されコイル4が構成されている。

【0014】次に、上記のように構成される実施の形態1における回転電機の固定子の製造方法を図に基づいて説明する。まず、図2に示すように線材3を矩形状に巻回し、スロット1bに接着される第1および第2の辺部2a、2bは、整列巻きとして、スロット1b内に嵌挿可能な厚さに積層し、第1および第2の辺部2a、2bの一端側に連なる第3の辺部2cは、各線材3を第1および第2の辺部2a、2bの延在方向にずらして一列に積層し、第1および第2の辺部2a、2bの他端側に連なる第4の辺部2dは、鉄心1の形状に沿った彎状に積層することにより複数のコイル組合体2を形成する。

【0015】次に、図5に示すようにコイル組合体2の第1および第2の辺部2a、2bの両端近傍を、一対のコイル保持部材5、6で保持してコイル挿入治具7の上方に位置させる。そして、図6に示すようにワイヤガイドブレード7aに沿って下降させストリッパ7bで受けることによりコイル挿入治具7に保持させる。次いで、図7に示すようにコイル挿入治具7を鉄心1の下方に、そのワイヤガイドブレード7aの先端が鉄心1の内側と対応するように位置させ、図8に示すようにコイル挿入治具7を上昇させることにより、ワイヤガイドブレード7aを鉄心1の内周面に沿って移動させ内側を貫通させる。なお、この時、鉄心1とコイル組合体2との関係は図4(A)に示すような状態になっている。

【0016】次に、図9に示すようにワイヤガイドブレード7aはそのままの状態で、ストリッパ7bを上昇させることによりコイル組合体2をワイヤガイドブレード

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7aに沿って上方に移動させ、鉄心1の下部に配置されたコイル組合体2をスロット1b内に導くコイル索内部材8により、まず第3の辺部2cをスロット1bの開口部を図4(A)中矢印で示す方向に通過させ、さらにコイル組合体2を上方に移動させることにより、図10に示すように第3の辺部2cに達なる第1および第2の辺部2a、2bをスロット1b内に導き、両辺部2a、2bの全領域がスロット1b内に嵌合される位置で、ストリップバ7bの上昇を停止させることにより、鉄心1とコイル組合体2との関係を図4(B)に示す状態とする。なお、コイル保持部材5は図9に示す状態で、又、コイル保持部材5およびコイル索内部材8は図10に示す状態で、それぞれコイル組合体2との係合を解いて図中矢印で示すように外側へ移動して待機する。

【0017】次に、図11に示すような成形部材9を上方に配置し、図示はしないがワイヤガイドブレード7aをストリップバ7bの上面より下方に待機させた後、図12に示すように成形部材9を下降させ第3の辺部2cを上方から押しつぶすことにより、図13に示すように第3の辺部2cを第4の辺部2dと同様の形状に成形する。以下、上記と同様の動作を繰り返すことにより、所定の数のコイル組合体2をn個ずつ離れた一对のスロット1b内に順次挿入し、全てのスロット1b内にコイル組合体2が装着されてコイル4が構成され、鉄心1と共に回転電機の固定子10が完成する。

【0018】このように上記実施の形態1によれば、線材3が矩形状に巻回され、所定のスロット1bとこれから離れた位置のスロット1bに嵌合される第1および第2の辺部2a、2bを、整列巻きしてスロット1b内に嵌合可能な厚さに積層し、これら第1および第2の辺部2a、2bの一端側に達なる第3の辺部2cを、各線材3が第1および第2の辺部2a、2bの延在方向にずれるように一列に積層し、第1および第2の辺部2a、2bの他端側に達なる第4の辺部2dを、鉄心1の形状に沿った強状に形成することにより複数のコイル組合体2を構成し、コイル組合体2の姿勢を保持して鉄心1の一端側から接近させ、第3の辺部2cを両スロット1bの開口部を通過させるとともに、さらに一端側から他端側に移動させることにより、第1および第2の辺部2a、2bを両スロット1b内に導いて装着するようにしているので、開口部の幅がスロット1bの幅より狭く形成された鉄心1においても、第1および第2の辺部2a、2bが整列巻きされたコイル組合体2をスロット1b内に装着することができるため、コイル4の占積率を高めモータの効率を向上させることが可能になる。

【0019】なお、上記構成では、コイル組合体2の第3の辺部2cを、各線材3が第1および第2の辺部2a、2bの延在方向にずれるように一列に積層しているが、勿論これに限定されるものではなく、要するに図2中で示す部分をスロット1bの開口部の幅より小

さな厚さに積層して、第3の辺部2cが開口部を通過できるようにすれば良く、上記と同様の効果を得ることができる。又、コイル組合体2の姿勢を両コイル保持部材5、6で保持して、鉄心1に装着するようにしているが、接着等で固定して姿勢を保持するようにしても良く、さらに又、樹脂で固めて姿勢を保持するようすれば、別にスロット絶縁を施す必要がなく、コストの低減を図ることができる。さらに又、コイル組合体2の第3の辺部2cを、成形部材9により押しつぶして成形することにより小形化が可能になる。

【0020】実施の形態2、図14はこの発明の実施の形態2における回転電機の固定子の要部の構成を示す断面図である。図において、上記実施の形態1におけると同様な部分は同一符号を付して説明を省略する。11は図示はしないが上記実施の形態1におけるコイル組合体2と同様に第1ないし第3の辺部を有するコイル組合体で、第1および第2の辺部11a、11bに位置する部位が、少なくとも積層方向に隣接する当接面同士が偏平状に成形されて整列巻きされている。

【0021】このように上記実施の形態2によれば、コイル組合体11の第1および第2の辺部11a、11bに位置する部位の少なくとも積層方向に隣接する当接面同士を偏平状に成形して整列巻きするようしているので、整列が容易となりさらに占積率を高め、モータの効率を向上させることができる。なお、上記構成では、偏平状に成形する部位を第1および第2の辺部11a、11bとしたが、第1ないし第4の辺部全ての部位を偏平状に成形しても良いことは言うまでもない。又、上記各実施の形態1、2では、1つのスロットに1組のコイル組合体が挿入された場合について説明したが、これに限定されるものではなく、複数個のコイル組合体を積重して挿入するものに適用しても、同様の効果を發揮し得ることは言うまでもない。

【0022】

【発明の効果】以上のように、この発明の請求項1によれば、内側面に所定の間隔を介して形成されるスロットの幅よりスロットの開口部の幅が狭く形成された鉄心と、巻回され、少なくとも対応する一对のスロットにそれぞれ装着される第1および第2の辺部が、整列巻きされて両スロット内に嵌合可能な厚さに積層され、第1および第2の辺部の一端側に達なる第3の辺部が、第1および第2の辺部の延在方向にずれて積層方向の厚さがスロットの開口部の幅より小さく積層されて形成された複数のコイル組合体を、第3の辺部をスロットの開口部を通過させることにより第1および第2の辺部を両スロット内に順次装着して形成されるコイルとを備えたので、コイルの占積率を高め効率の向上を図ることが可能な回転電機の固定子を提供することができる。

【0023】又、この発明の請求項2によれば、請求項1において、線材の少なくともスロットにそれぞれ装着

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される第1および第2の辺部に位置する部位の横層方向に隣接する当該面同士を扁平状に成形したので、さらに占積率を高め効率の向上を図ることが可能な回転電機の固定子を提供することができる。

【0024】又、この発明の請求項3によれば、矩形状に巻きし、内周面に所定の間隔を介して形成されるスロットの幅よりスロットの開口部の幅が狭く形成された鉄心の少なくとも対応する一対のスロットにそれぞれ接着される第1および第2の辺部を整列巻きして両スロット内に嵌合可能な厚さに、第1および第2の辺部の各一端側に追なる第3の辺部を第1および第2の辺部の延在方向にずらして、横層方向の厚さがスロットの開口部の幅より小さな厚さにそれぞれ横層して複数のコイル組合体を形成する工程と、コイル組合体の姿勢を保持する工程と、各コイル組合体を鉄心の一端側から接近させて第3の辺部を両スロットの開口部を通過させるとともに、鉄心の一端側から他端側に移動させることにより第1および第2の辺部を両スロット内に導きそれぞれ接着する工程とを包含するようにしたので、コイルの占積率を高め効率の向上を図ることが可能な回転電機の固定子の製造方法を提供することができる。

【0025】又、この発明の請求項4によれば、請求項3において、導材の少なくともスロットにそれぞれ接着される第1および第2の辺部に位置する部位の横層方向に隣接する当該面同士を扁平状に成形して整列巻きするようにしたので、さらにコイルの占積率を高め効率の向上を図ることが可能な回転電機の固定子の製造方法を提供することができる。

【0026】又、この発明の請求項5によれば、請求項3または4において、コイル組合体の姿勢を回転を制御して固定することにより保持するようにしたので、コストの低減を図ることが可能な回転電機の固定子の製造方法を提供することができる。

【0027】又、この発明の請求項6によれば、請求項3ないし5のいずれかにおいて、各コイル組合体の第3の辺部を成形して出っ張りを抑制する工程を包含したので、小形化を図ることが可能な回転電機の固定子の製造方法を提供することができる。

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## \*【図面の簡単な説明】

【図1】この発明の実施の形態1における回転電機の固定子の構成を示し、(A)は正面断面図、(B)は部分詳細図である。

【図2】図1におけるコイル組合体の構成を示す斜視図である。

【図3】図2におけるコイル組合体が鉄心に接着された状態を示す正面図である。

【図4】図3におけるコイル組合体の鉄心への接着手順を示し、(A)は接着前の斜視図、(B)は接着後の斜視図である。

【図5】図1における回転電機の固定子の製造の一工程を示す図である。

【図6】図1における回転電機の固定子の製造の一工程を示す図である。

【図7】図1における回転電機の固定子の製造の一工程を示す図である。

【図8】図1における回転電機の固定子の製造の一工程を示す図である。

【図9】図1における回転電機の固定子の製造の一工程を示す図である。

【図10】図1における回転電機の固定子の製造の一工程を示す図である。

【図11】図1における回転電機の固定子の製造の一工程を示す図である。

【図12】図1における回転電機の固定子の製造の一工程を示す図である。

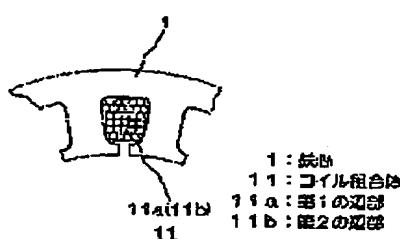
【図13】図1における回転電機の固定子の製造の一工程を示す図である。

【図14】この発明の実施の形態2における回転電機の固定子の要部の構成を示す断面図である。

## 【符号の説明】

- 1 鉄心、1a 磁極ティース部、1b スロット、
- 2、11 コイル組合体、2a、11a 第1の辺部、  
2b、11b 第2の辺部、2c 第3の辺部、2d  
第4の辺部、3 線材、4 コイル、5、6 コイル保持部材、7 コイル挿入治具、7a ワイヤガイドブレード、7b ストリッパー、8 コイル索内部材。

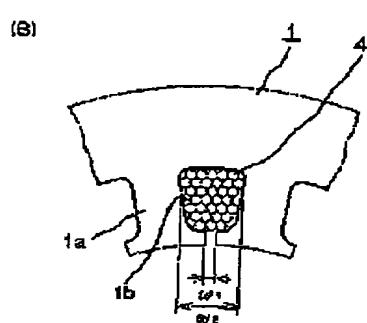
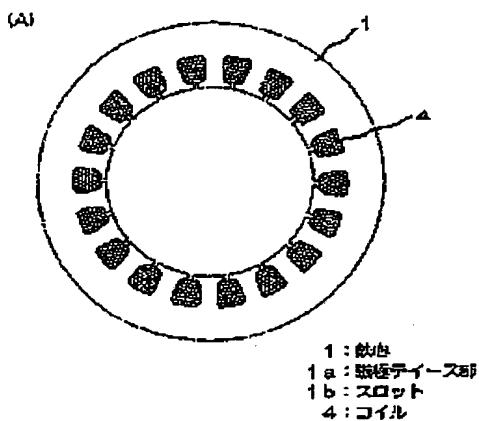
【図14】



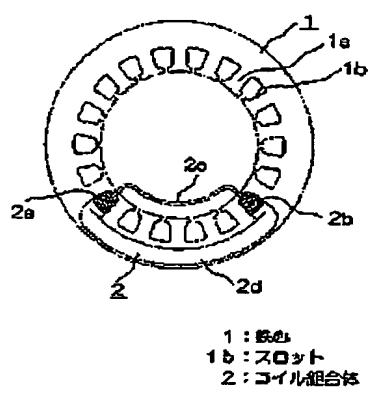
(6)

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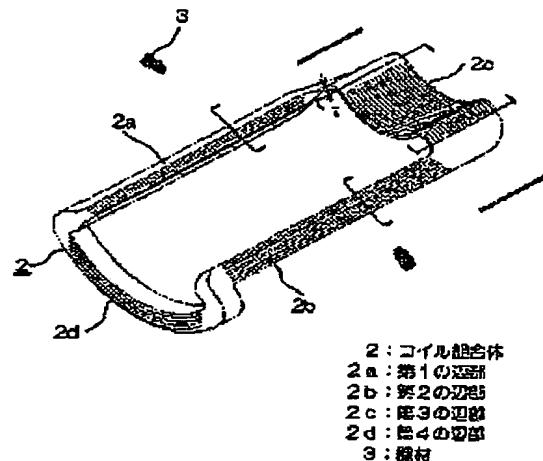
【図1】



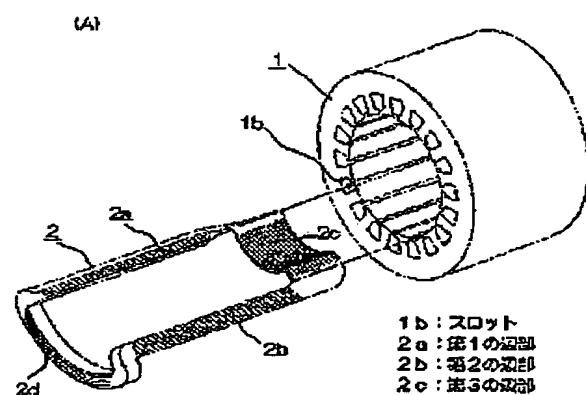
【図3】



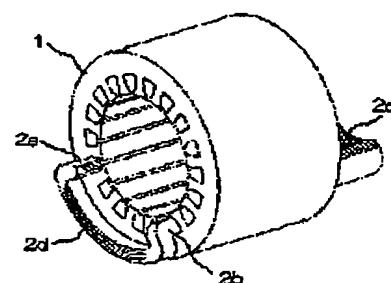
【図2】



【図4】



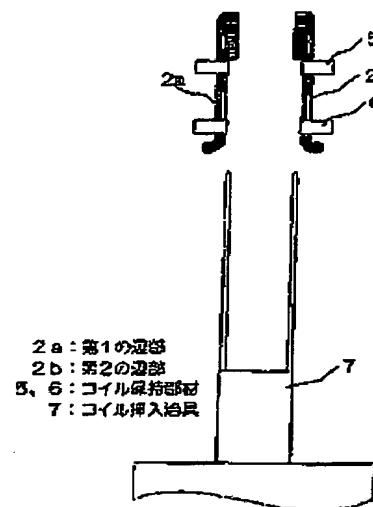
(B)



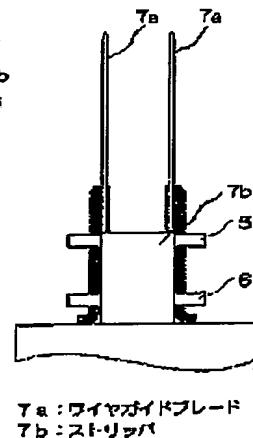
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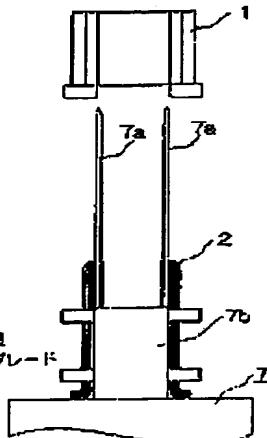
【図5】



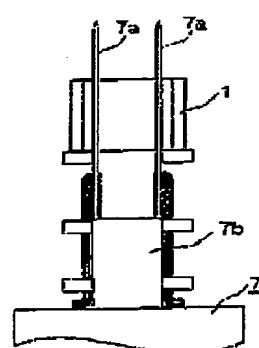
【図6】



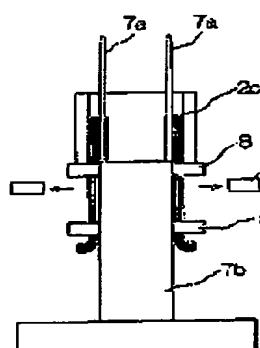
【図7】



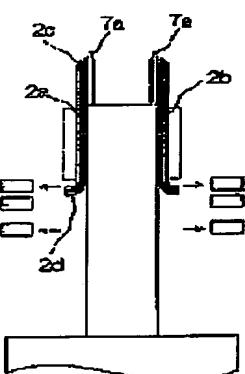
【図8】



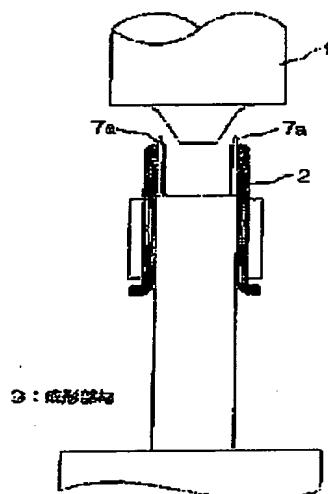
【図9】



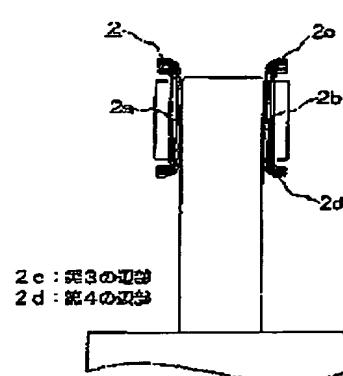
【図10】



【図11】



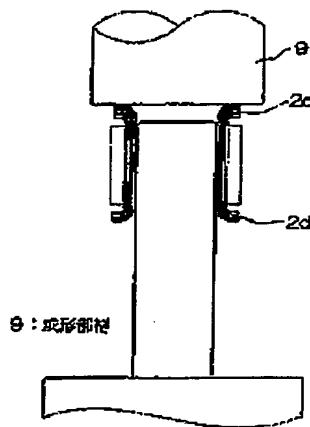
【図13】



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【図12】



## フロントページの続き

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SS09 SS18 SS44 TT27

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## CLAIMS

## [Claim(s)]

[Claim 1] The iron core in which the width of face of opening of the above-mentioned slot was narrowly formed from the width of face of the slot formed in inner skin through predetermined spacing, The 1st and 2nd side sections with which the above-mentioned slot of a pair which is wound and corresponds at least is equipped, respectively The 3rd side section which an alignment volume is carried out, and a laminating is carried out to the thickness which can be fitted in into both the above-mentioned slots, and stands in a row in the end side of the above 1st and the 2nd side section Two or more coil union objects with which it shifted in the extension direction of the above 1st and the 2nd side section, and the laminating of the thickness of the direction of a laminating was carried out smaller than the width of face of opening of the above-mentioned slot, and it was formed The stator of the dynamo-electric machine characterized by having the coil formed by carrying out sequential wearing of the above 1st and the 2nd side section into both the above-mentioned slots by passing opening of the above-mentioned slot for the side section of the above 3rd.

[Claim 2] The part located in the 1st of a wire rod with which a slot is equipped at least, respectively, and the 2nd side section is the stator of the dynamo-electric machine according to claim 1 characterized by fabricating the contact sides which adjoin in the direction of a laminating in the shape of flat.

[Claim 3] The width of face of opening of the above-mentioned slot carries out the alignment volume of the 1st and 2nd side sections with which the above-mentioned slot of the pair to which the iron core formed narrowly corresponds at least is equipped, respectively from the width of face of the slot formed in winding and inner skin through predetermined spacing. In the thickness which can be fitted in into both the above-mentioned slots The 3rd side section which stands in a row in one one end each of the above 1st and the 2nd side section is shifted in the extension direction of the above 1st and the 2nd side section. The process in which the thickness of the direction of a laminating carries out a laminating to thickness smaller than the width of face of opening of the above-mentioned slot, respectively, and forms two or more coil union objects, By making the process holding the posture of the above-mentioned coil union object, and each above-mentioned coil union object approach from the end side of the above-mentioned iron core, while passing opening of both the above-mentioned slots, the side section of the above 3rd The manufacture approach of the stator of the dynamo-electric machine characterized by including the process which draws the 1st and 2nd side sections in both the above-mentioned slots, and equips with them, respectively by making it move to an other end side from the end side of the above-mentioned iron core.

[Claim 4] The part located in the 1st of a wire rod with which a slot is equipped at least, respectively, and the 2nd side section is the manufacture approach of the stator of the dynamo-electric machine according to claim 3 characterized by fabricating the contact sides which adjoin in the direction of a laminating in the shape of flat, and carrying out an alignment volume.

[Claim 5] The manufacture approach of the stator of the dynamo-electric machine according to claim 3 or 4 characterized by holding the posture of a coil union object by hardening a perimeter by resin.

[Claim 6] The manufacture approach of the stator of the dynamo-electric machine according to claim 3 to 5 characterized by including the process which fabricates the 3rd side section of each coil union object, and controls a lug.

[Translation done.]

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## DETAILED DESCRIPTION

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### [Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the stator and its manufacture approach of the dynamo-electric machine with which it was equipped with the space factor sufficient [ a coil ] in the slot of the iron core in which the aperture width of a slot was formed narrowly from a slot width.

[0002]

[Description of the Prior Art] In recent years, the efficient motor is called for from the commercial scene for energy saving, and improvement in the effectiveness of a motor is achieved by raising the consistency of the coil with which it is generally equipped in the slot of an iron core, i.e., a space factor. And in order to raise the space factor of the above coils, although illustration is not carried out, by JP,10-271733,A, inserting and equipping radial with the coil by which the alignment volume was carried out to the bundle of the cross section according to the cross section of a slot out of a slot, beforehand, from the opening side of the same width of face as the width of face of a slot, where the configuration is held is indicated.

[0003]

[Problem(s) to be Solved by the Invention] Where the configuration is held, when the stator of the conventional dynamo-electric machine is inserted in radial from the opening side of the same width of face as the width of face of a slot and equips with the coil by which the alignment volume was carried out to the bundle of the cross section according to the cross section of a slot out of a slot beforehand as mentioned above, improvement in the space factor of a coil is achieved. However, if the width of face of opening of a slot is large, the magnetic reluctance in the opening section will increase. Since reduction of effective magnetic flux is caused in increase of an exciting current, and a permanent magnet type motor and still more magnetic concave and a convex become large in an induction motor, a slot higher harmonic increases. The harmonic loss generated in a rotator and a stator increases, and, in addition, various troubles -- in a servo motor etc., lead to increase of cogging, and the controllability at the time of positioning falls -- arise further.

[0004] For this reason, although the iron core which made width of face of opening of a slot narrower than the width of face of a slot by making the tip of the magnetic pole teeth section project on hoop direction both sides will be used In this case, since it becomes impossible to make the coil by which the alignment volume was beforehand carried out as mentioned above to the bundle of the cross section according to the cross section of a slot out of the slot insert in radial from the opening side of a slot as it is, There was a trouble that it became difficult to raise the space factor of a coil and to raise the effectiveness of a motor.

[0005] This invention was made in order to cancel the above troubles, and it aims at offering the stator and its manufacture approach of the dynamo-electric machine which the space factor of a coil is raised and can raise the effectiveness of a motor also in the iron core in which the width of face of opening of a slot was formed more narrowly than the width of face of a slot.

[0006]

[Means for Solving the Problem] The stator of the dynamo-electric machine concerning claim 1 of this invention The iron core in which the width of face of opening of a slot was narrowly formed from the width of face of the slot formed in inner skin through predetermined spacing, The 1st and 2nd side sections with which the slot of a pair which is wound and corresponds at least is equipped, respectively The 3rd side section which an alignment volume is carried out, and a laminating is carried out to the thickness which can be fitted in into both slots, and stands in a row in the end side of the 1st and 2nd side sections Two or more coil union objects with which it shifted in the extension direction of the 1st and 2nd side sections, and the laminating of the thickness of the direction of a laminating was carried out smaller than the width of face of opening of a slot, and it was formed It has the coil

formed by carrying out sequential wearing of the 1st and 2nd side sections into both slots by passing opening of a slot for the 3rd side section.

[0007] Moreover, the stator of the dynamo-electric machine concerning claim 2 of this invention fabricates the contact sides which adjoin in the direction of a laminating of the part located in the 1st of a wire rod with which a slot is equipped at least, respectively, and the 2nd side section in the shape of flat in claim 1.

[0008] Moreover, the manufacture approach of the stator of the dynamo-electric machine concerning claim 3 of this invention The width of face of opening of a slot carries out the alignment volume of the 1st and 2nd side sections with which the slot of the pair to which the iron core formed narrowly corresponds at least is equipped, respectively from the width of face of the slot formed in the shape of a rectangle through predetermined spacing at winding and inner skin. In the thickness which can be fitted in into both slots The 3rd side section which stands in a row in one one end each of the 1st and 2nd side sections is shifted in the extension direction of the 1st and 2nd side sections. The process in which the thickness of the direction of a laminating carries out a laminating to thickness smaller than the width of face of opening of a slot, respectively, and forms two or more coil union objects, By making the process holding the posture of a coil union object, and each coil union object approach from the end side of an iron core, while passing opening of both slots, the 3rd side section The process which draws the 1st and 2nd side sections in both slots, and equips with them, respectively is included by making it move to an other end side from the end side of an iron core.

[0009] Moreover, in claim 3, the manufacture approach of the stator of the dynamo-electric machine concerning claim 4 of this invention fabricates the contact sides which adjoin in the direction of a laminating of the part located in the 1st of a wire rod with which a slot is equipped at least, respectively, and the 2nd side section in the shape of flat, and is made to carry out an alignment volume.

[0010] Moreover, the manufacture approach of the stator of the dynamo-electric machine concerning claim 5 of this invention holds the posture of a coil union object by hardening a perimeter by resin in claims 3 or 4.

[0011] Moreover, the manufacture approach of the stator of the dynamo-electric machine concerning claim 6 of this invention includes the process which fabricates the 3rd side section of each coil union object, and controls a lug in claim 3 thru/or either of 5.

[0012]

[Embodiment of the Invention] Hereafter, the gestalt of implementation of this invention is explained based on drawing.

Gestalt 1. drawing 1 of operation shows the configuration of the stator of the dynamo-electric machine in the gestalt 1 of implementation of this invention. The perspective view showing the configuration of a coil union object [ in / (A) / a transverse-plane sectional view and (B), and / in drawing 2 / drawing 1 ], [ partial detail drawing ] The front view in which a coil union object [ in / in drawing 3 / drawing 2 ] shows the condition that the iron core was equipped, Drawing 4 shows the wearing procedure to the iron core of the coil union object in drawing 3 , and the perspective view, drawing 5 , or drawing 13 after wearing is drawing showing each process of manufacture of the stator of a dynamo-electric machine [ in / (A) and / in (B) / drawing 1 ]. [ the perspective view before wearing ]

[0013] In drawing, it is the iron core where 1 has the shape of a cylinder, two or more magnetic pole teeth section 1a to which the projection tip protruded through predetermined spacing at both sides in inner skin is formed, and slot 1b with the width of face omega 1 of opening narrower than the width of face omega 2 is formed among each [ these ] magnetic pole teeth section 1a, respectively. The 1st and 2nd side section 2a with which 2 is the coil union object around which the wire rod 3 was wound in the shape of a rectangle, and predetermined slot 1b and slot 1b of the location distant n pieces from now on are equipped, The alignment volume of the 2b is carried out, a laminating is carried out to the thickness which can be fitted in into slot 1b, and these [ 1st ] and 2nd side section 2a, and 3rd side section 2c that stands in a row in the end side of 2b Each wire rod 3 shifts in 1st and 2nd side section 2a and the extension direction of 2b, the laminating of the thickness t of the direction of a laminating is carried out smaller than the width of face omega 1 of opening of slot 1b of an iron core 1, and the laminating of the 2d of the 4th side section which stands in a row in the 1st and 2nd side section 2a and other end side of 2b is carried out to the arc in alignment with the configuration of an iron core 1. And it is equipped with 1st and 2nd side section 2a and 2b in slot 1b of the pair which these n coil union objects 3 left at a time, and the coil 4 is constituted.

[0014] Next, the manufacture approach of the stator of the dynamo-electric machine in the gestalt 1 of the implementation constituted as mentioned above is explained based on drawing. First, 1st [ which is equipped with a wire rod 3 by winding and slot 1b in the shape of a rectangle as shown in drawing 2 ], and 2nd side section 2a and 2b As an alignment volume, carry out a laminating to the thickness which can be fitted in into slot 1b, and 1st and 2nd side section 2a and 3rd side section 2c which stands in a row in the end side of 2b Each wire rod 3 is shifted in

1st and 2nd side section 2a and the extension direction of 2b, a laminating is carried out to a single tier, and 2d of 4th side section which stands in a row in the 1st and 2nd side section 2a and other end side of 2b forms two or more coil union objects 2 by carrying out a laminating to the arc in alignment with the configuration of an iron core 1. [0015] Next, as shown in drawing 5, it holds 1st [ of the coil union object 2 ], and 2nd side section 2a, and near the both ends of 2b by the coil attachment components 5 and 6 of a pair, and they are located above the coil insertion fixture 7. And it is made to hold to the coil insertion fixture 7 by making it descend along with wire guide blade 7a, and winning popularity by stripper 7b, as shown in drawing 6. Subsequently, wire guide blade 7a is moved for the coil insertion fixture 7 along with the inner skin of an iron core 1 by [ of an iron core 1 ] making it caudad, located so that the tip of the wire guide blade 7a may correspond with the inside of an iron core 1, and raising the coil insertion fixture 7, as shown in drawing 8, and the inside is made to penetrate, as shown in drawing 7. In addition, the relation between an iron core 1 and the coil union object 2 is in the condition that it is shown in drawing 4 (A) at this time.

[0016] Next, as shown in drawing 9, wire guide blade 7a is in a condition as it is. By the interior material 8 of a coil proposal which is made to move the coil union object 2 up along with wire guide blade 7a, is arranged at the lower part of an iron core 1, and leads the coil union object 2 in slot 1b by raising stripper 7b. By passing 3rd side section 2c in the direction which shows opening of slot 1b by the drawing 4 (A) Nakaya mark first, and moving the coil union object 2 up further In the location where 1st [ which stands in a row in 3rd side section 2c ], and 2nd side section 2a, and 2b are drawn in slot 1b in as shown in drawing 10, and both-sides section 2a and all the fields of 2b are fitted in into slot 1b. By stopping the rise of stripper 7b, it considers as the condition which shows the relation between an iron core 1 and the coil union object 2 in drawing 4 (B). In addition, the coil attachment component 5 is in the condition shown in drawing 9, and the coil attachment component 5 and the interior material 8 of a coil proposal are in the condition shown in drawing 10, as engagement on the coil union object 2 is solved, respectively and the drawing Nakaya mark shows, it moves outside and it stands by.

[0017] Next, by dropping the shaping member 9 and crushing 3rd side section 2c from the upper part, although the shaping member 9 as shown in drawing 11 is arranged up and illustration is not carried out, after making wire guide blade 7a shunt the top face of stripper 7b caudad, as shown in drawing 12 R>2, as shown in drawing 13, 3rd side section 2c is fabricated in the same configuration as 2d of 4th side section. By repeating the same actuation as the above hereafter, sequential insertion is carried out into slot 1b of the pair which left a predetermined number of n coil union objects 2 at a time, it is equipped with the coil union object 2 in all slot 1b, a coil 4 is constituted, and the stator 10 of a dynamo-electric machine is completed with an iron core 1.

[0018] Thus, according to the gestalt 1 of the above-mentioned implementation, a wire rod 3 is wound in the shape of a rectangle. The 1st and 2nd side section 2a with which predetermined slot 1b and slot 1b of the location distant n pieces from now on are equipped, The alignment volume of the 2b is carried out and it carries out a laminating to the thickness which can be fitted in into slot 1b. These [ 1st ] and 2nd side section 2a, Each wire rod 3 3rd side section 2c which stands in a row in the end side of 2b The 1st and 2nd side section 2a, A laminating is carried out to a single tier so that it may shift in the extension direction of 2b. The 1st and 2nd side section 2a, Two or more coil union objects 2 are constituted by forming in the arc in alignment with the configuration of an iron core 1 2d of 4th side section which stands in a row in the other end side of 2b. Hold the posture of the coil union object 2, make it approach from the end side of an iron core 1, and while passing opening of both slot 1b, 3rd side section 2c Since 1st and 2nd side section 2a and 2b are drawn in both slot 1b and he is trying to equip with them by making it move to an other end side from an end side furthermore Also in the iron core 1 in which the width of face of opening was formed more narrowly than the width of face of slot 1b, since it can equip with the coil union object 2 with which the alignment volume of 1st and 2nd side section 2a and the 2b was carried out in slot 1b, it becomes possible to raise the space factor of a coil 4 and to raise the effectiveness of a motor.

[0019] In addition, although the laminating of the 3rd side section 2c of the coil union object 2 is carried out to the single tier with the above-mentioned configuration so that each wire rod 3 may shift in 1st and 2nd side section 2a and the extension direction of 2b The laminating of not the thing limited to this, of course but the part shown in [ t ] drawing 2 in short can be carried out to thickness smaller than the width of face omega 1 of opening of slot 1b, and the same effectiveness as the above can be acquired that what is necessary is for 3rd side section 2c just to enable it to pass opening. Moreover, although the posture of the coil union object 2 is held by both the coil attachment components 5 and 6 and he is trying to equip an iron core 1, it fixes by adhesion etc. and may be made to hold a posture, and if it hardens by resin and a posture is held, it is not necessary to give slot insulation independently, and reduction of cost can be aimed at further again. A miniaturization becomes possible further again by crushing 3rd side section 2c of the coil union object 2 by the shaping member 9, and fabricating it.

[0020] Gestalt 2. drawing 14 of operation is the sectional view showing the configuration of the important section of the stator of the dynamo-electric machine in the gestalt 2 of implementation of this invention. In drawing, also in the gestalt 1 of the above-mentioned implementation, the same part attaches the same sign and omits explanation. The contact sides by which the part which are the coil union object 2 in the gestalt 1 of the above-mentioned implementation and the coil union object which has the 1st thru/or 3rd side section similarly although illustration is not carried out, and is located in the 1st and 2nd side sections 11a and 11b adjoins in the direction of a laminating at least are fabricated in the shape of flat, and the alignment volume of 11 is carried out.

[0021] Thus, since according to the gestalt 2 of the above-mentioned implementation the contact sides of a part which are located in the 1st of the coil union object 11 and the 2nd side section 11a and 11b and which adjoin in the direction of a laminating at least are fabricated in the shape of flat and they are made to carry out an alignment volume, it becomes possible for alignment to become easy, to raise a space factor further, and to raise the effectiveness of a motor. In addition, although the part fabricated in the shape of flat was made into the 1st and 2nd side sections 11a and 11b with the above-mentioned configuration, it cannot be overemphasized that the part of the 1st thru/or all the 4th \*\*\*\* may be fabricated in the shape of flat. Moreover, although the gestalten 1 and 2 of each above-mentioned implementation explained the case where 1 set of coil union objects were inserted in one slot, even if it applies to what is not limited to this, and accumulates and inserts two or more coil union objects, it cannot be overemphasized that the same effectiveness can be demonstrated.

[0022]

[Effect of the Invention] As mentioned above, the iron core in which the width of face of opening of a slot was narrowly formed from the width of face of the slot formed in inner skin through predetermined spacing according to claim 1 of this invention, The 1st and 2nd side sections with which the slot of a pair which is wound and corresponds at least is equipped, respectively The 3rd side section which an alignment volume is carried out, and a laminating is carried out to the thickness which can be fitted in into both slots, and stands in a row in the end side of the 1st and 2nd side sections Two or more coil union objects with which it shifted in the extension direction of the 1st and 2nd side sections, and the laminating of the thickness of the direction of a laminating was carried out smaller than the width of face of opening of a slot, and it was formed Since it had the coil formed by passing opening of a slot for the 3rd side section by carrying out sequential wearing of the 1st and 2nd side sections into both slots, the stator of the dynamo-electric machine which the space factor of a coil is raised and can aim at improvement in effectiveness can be offered.

[0023] Moreover, since the contact sides which adjoin in the direction of a laminating of the part located in the 1st of a wire rod with which a slot is equipped at least, respectively, and the 2nd side section in claim 1 were fabricated in the shape of flat according to claim 2 of this invention, the stator of the dynamo-electric machine which a space factor is raised further and can aim at improvement in effectiveness can be offered.

[0024] According to claim 3 of this invention, in the shape of a rectangle Moreover, winding, The width of face of opening of a slot carries out the alignment volume of the 1st and 2nd side sections with which the slot of the pair to which the iron core formed narrowly corresponds at least is equipped, respectively from the width of face of the slot formed in inner skin through predetermined spacing. In the thickness which can be fitted in into both slots The 3rd side section which stands in a row in one one end each of the 1st and 2nd side sections is shifted in the extension direction of the 1st and 2nd side sections. The process in which the thickness of the direction of a laminating carries out a laminating to thickness smaller than the width of face of opening of a slot, respectively, and forms two or more coil union objects, By making the process holding the posture of a coil union object, and each coil union object approach from the end side of an iron core, while passing opening of both slots, the 3rd side section Since it was made to include the process which draws the 1st and 2nd side sections in both slots, and equips with them, respectively by making it move to an other end side from the end side of an iron core, the manufacture approach of the stator of the dynamo-electric machine which the space factor of a coil is raised and can aim at improvement in effectiveness can be offered.

[0025] Moreover, since according to claim 4 of this invention the contact sides which adjoin in the direction of a laminating of the part located in the 1st of a wire rod with which a slot is equipped at least, respectively, and the 2nd side section in claim 3 are fabricated in the shape of flat and they were made to carry out an alignment volume, the manufacture approach of the stator of the dynamo-electric machine which the space factor of a coil is raised further and can aim at improvement in effectiveness can be offered.

[0026] Moreover, since the posture of a coil union object was held by hardening a perimeter by resin in claims 3 or 4 according to claim 5 of this invention, the manufacture approach of the stator of the dynamo-electric machine which can aim at reduction of cost can be offered.

[0027] Moreover, since the process which fabricates the 3rd side section of each coil union object, and controls a lug in claim 3 thru/or either of 5 was included according to claim 6 of this invention, the manufacture approach of the stator of the dynamo-electric machine which can attain a miniaturization can be offered.

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[Translation done.]

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2. \*\*\* shows the word which can not be translated.
3. In the drawings, any words are not translated.

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## DESCRIPTION OF DRAWINGS

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### [Brief Description of the Drawings]

[Drawing 1] The configuration of the stator of the dynamo-electric machine in the gestalt 1 of implementation of this invention is shown, (A) is a transverse-plane sectional view and (B) is partial detail drawing.

[Drawing 2] It is the perspective view showing the configuration of the coil union object in drawing 1.

[Drawing 3] It is the front view showing the condition that the iron core was equipped with the coil union object in drawing 2.

[Drawing 4] The wearing procedure to the iron core of the coil union object in drawing 3 is shown, (A) is a perspective view before wearing and (B) is a perspective view after wearing.

[Drawing 5] It is drawing showing one process of manufacture of the stator of the dynamo-electric machine in drawing 1.

[Drawing 6] It is drawing showing one process of manufacture of the stator of the dynamo-electric machine in drawing 1.

[Drawing 7] It is drawing showing one process of manufacture of the stator of the dynamo-electric machine in drawing 1.

[Drawing 8] It is drawing showing one process of manufacture of the stator of the dynamo-electric machine in drawing 1.

[Drawing 9] It is drawing showing one process of manufacture of the stator of the dynamo-electric machine in drawing 1.

[Drawing 10] It is drawing showing one process of manufacture of the stator of the dynamo-electric machine in drawing 1.

[Drawing 11] It is drawing showing one process of manufacture of the stator of the dynamo-electric machine in drawing 1.

[Drawing 12] It is drawing showing one process of manufacture of the stator of the dynamo-electric machine in drawing 1.

[Drawing 13] It is drawing showing one process of manufacture of the stator of the dynamo-electric machine in drawing 1.

[Drawing 14] It is the sectional view showing the configuration of the important section of the stator of the dynamo-electric machine in the gestalt 2 of implementation of this invention.

### [Description of Notations]

1 Iron Core, 1a Magnetic Pole Teeth Section, 1B 2 Slot, 11 Coil Union Object, 2a, 11a The 1st side section, 2b, 11b The 2nd side section, 2c The 3rd side section, 2d The 4th side section, 3 A wire rod, 4 5 A coil, 6 A coil attachment component, 7 A coil insertion fixture, 7a Wire guide blade, 7b A stripper, 8 Interior material of a coil proposal.

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[Translation done.]

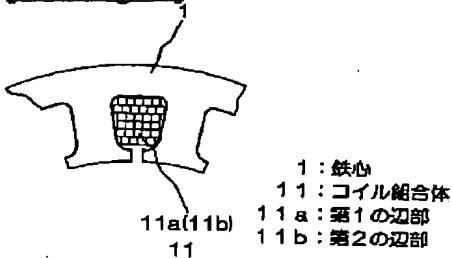
## \* NOTICES \*

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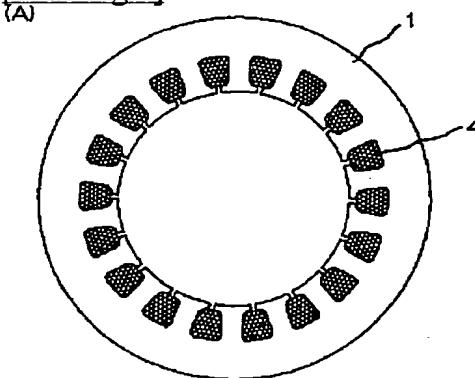
1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. \*\*\* shows the word which can not be translated.
3. In the drawings, any words are not translated.

## DRAWINGS

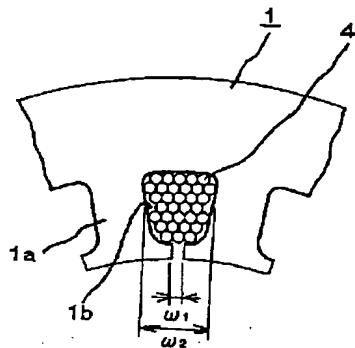
## [Drawing 14]



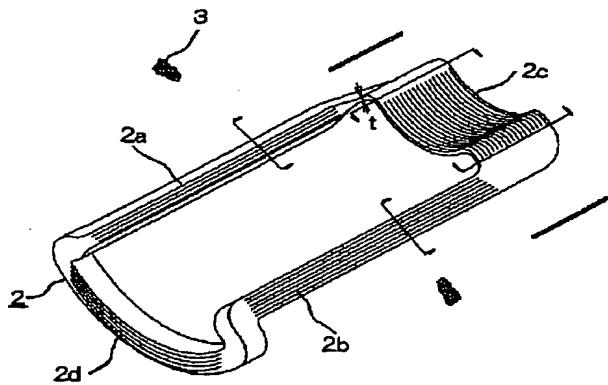
## [Drawing 1]



(B)

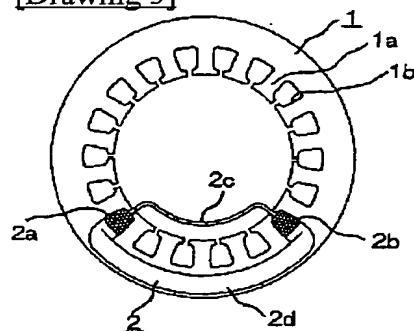


## [Drawing 2]



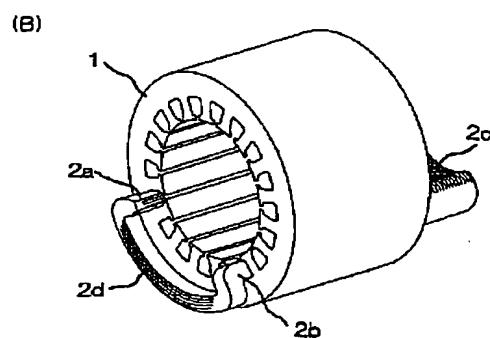
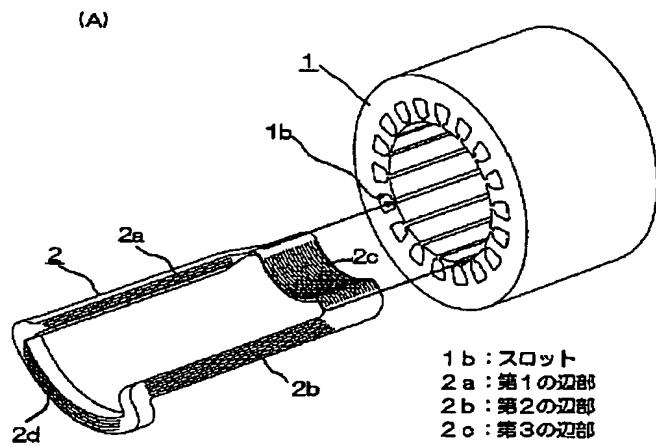
2 : コイル組合体  
2 a : 第1の端部  
2 b : 第2の端部  
2 c : 第3の端部  
2 d : 第4の端部  
3 : 鋼材

[Drawing 3]

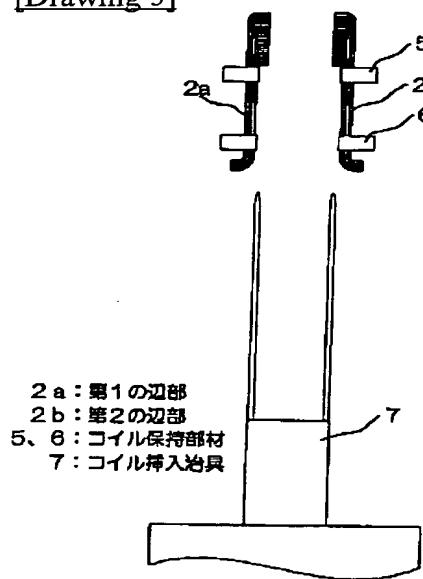


1 : 鋼心  
1 b : スロット  
2 : コイル組合体

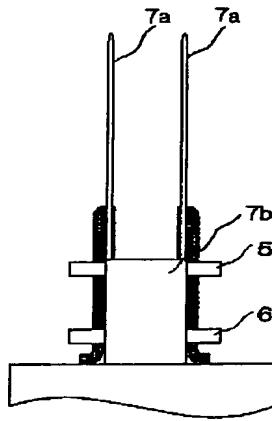
[Drawing 4]



[Drawing 5]

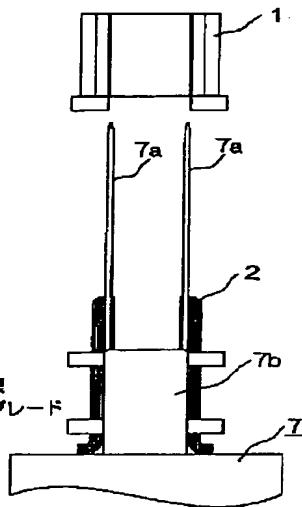


[Drawing 6]



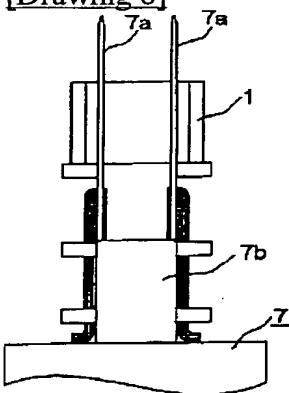
7a : ワイヤガイドプレード  
7b : ストリッパー

[Drawing 7]



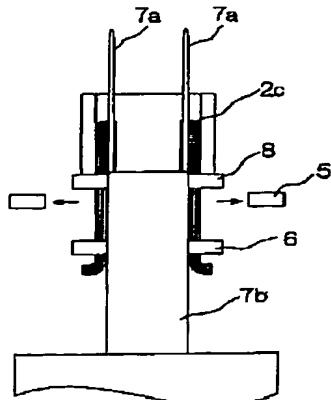
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2 : コイル挿入治具  
7a : ワイヤガイドプレード

[Drawing 8]



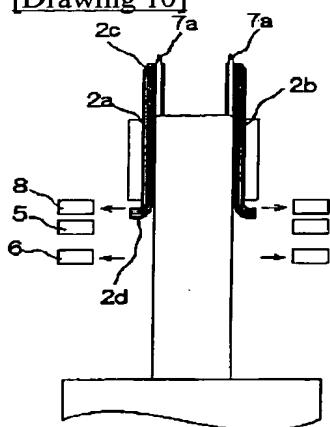
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2 : コイル挿入治具  
7a : ワイヤガイドプレード

[Drawing 9]

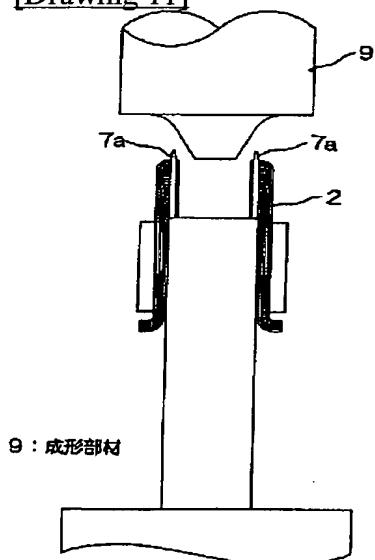


5:コイル保持部材  
8:コイル案内部材

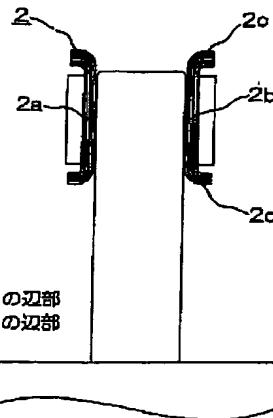
[Drawing 10]



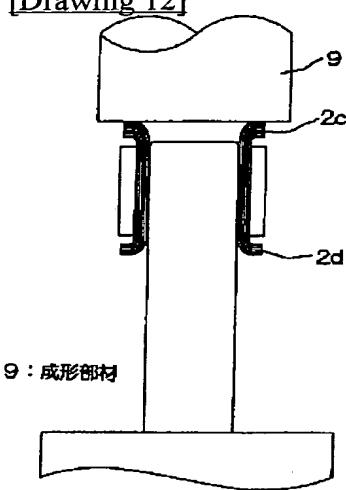
[Drawing 11]



[Drawing 13]



[Drawing 12]



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[Translation done.]